M.3 HAZARDOUS CHEMICAL IMPACTS TO HUMAN HEALTH

M.3.1 BACKGROUND

Two general types of adverse human health effects are assessed for hazardous chemical exposure in this PEIS. These are carcinogenic and non-carcinogenic effects. For this reason, two tables were developed to assist the risk assessor in the evaluation process. Table M.3.2–1, the Table of Chemical Toxicity Profiles, characterizes each chemical in terms of physical properties, potential exposure routes, and the effects on target tissues/organs that might be expected. The risk assessor will use it qualitatively to determine how exposure might occur (exposure route), what tissue or organ system might be affected (for example, central nervous system dysfunction or liver cancer) and whether the chemical might possess other properties affecting its bioavailability in a given matrix (that is, air, water, or soil). Table M.3.3–1, the Table of Exposure Limits, provides the risk assessor with the necessary information to calculate risk or expected effects should an individual be exposed to a hazardous chemical for a long time at low levels (chronic exposure) or to higher concentrations for a short time (acute). Where a dose effect calculation is required (milligram [mg]/kilogram [kg]/day), the Reference Dose (RfD) is applicable, and where an inhalation concentration effect is required, the Reference Concentration (for example, Reference Concentration [RfC] in mg/cubic meter) is applicable for chronic exposures. The Permissible Exposure Limit (PEL) value, which regulates worker's exposures over 8-hour (hr) periods, determines the concentration allowed for occupational exposures that would be without adverse acute effects. Other values, such as the Threshold Limit Value, are presented for the reader's information, because they are prepared by the American Conference of Governmental Industrial Hygienists (ACGIH) for guidance on exposures of 8-hr periods, and can be used to augment PELs or serve as exposure levels in the absence of a PEL. All currently regulated chemicals associated with each site and every hazardous chemical are presented in Table M.3.2–1 and Table M.3.3–1.

It was assumed that under normal operation conditions, members of the public would only receive chronic exposures at low levels in the form of air emissions from a centrally located source term at each site; since hazardous chemicals are not released into surface or ground waters or into soil, inhalation is assumed to be the only route of exposure. However, all chemical quantities are accounted for as air emissions, which are several orders of magnitude greater than by all other possible routes combined. It was further assumed that the MEI member of the public would be at the site boundary and this assumption was used when calculating all public exposures, which under normal operating conditions are expected to be chronic and at very low levels. For worker exposures to hazardous chemicals, it was assumed that individuals were exposed only to low air emission concentrations during an 8-hr day for a 40-hr week for a maximum working lifetime of 40 years. The point of exposure chosen was 100 m (328 ft) from a centrally located source term, since the precise placement of source terms onsite could not be made. Further, it could not be determined where the involved and non-involved workers would be relative to the emission sources.

For every site involved in the analysis, Hazard Indexes (HIs) were calculated for every alternative action relative to the site. The exposure concentrations of hazardous chemicals for the public and the onsite workers were developed using the Industrial Source Complex Short Term Model for point, area, and volume sources. This model, which estimates dispersion of emissions from these sources, has been field tested and recommended by the EPA. The modeled concentrations were compared to the unique RfC and PEL values unique to each chemical to yield Hazard Quotients (HQs) for the public and onsite workers, respectively. The HQs were summed to give the HIs for each alternative action at each site, as well as total HIs (that is, No Action HI + alternative-incremental HI). For cancer risk estimation, the inhaled concentrations were converted to doses in mg/kg/day, which were then multiplied by the slope factors unique to each identified carcinogen. The risks for all carcinogens associated with each alternative (incremental risk) at each site were summed, and the No Action cancer risk for each site was added in order to show the total risk should that alternative action be implemented at a given site. We apply this conservative approach to all sites using the guidance under the *Comprehensive Environmental Response Compensation and Liability Act*, which applies to Superfund sites. The first

assessment in risk analysis is considered a screening step. Under this guidance, if the HI is less than, or equal to 1.0, all non-cancer exposure values meet Occupational Safety and Health Administration (OSHA) standards; if the cancer risk is less than or equal to $1.0x10^{-6}$, no further analysis is done. A cancer risk of $1.0x10^{-6}$ from other sources cannot be distinguished from the cancer risk for an individual member of the general population.